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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
CHANG, AUDREY Y	

ART UNIT	PAPER NUMBER
2872	

NOTIFICATION DATE	DELIVERY MODE
10/05/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/500,461	TOMOYOSHI, ITO	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 4-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 4-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 26, 2007 has been entered.

2. This Office Action is also response to applicant's amendment filed on June 14, 2007 which has been entered into the file.

3. By this amendment, the applicant has amended claims 1, and 7.

4. Claims 1, 4-11 remain pending in this application.

5. The rejections to claims under 35 USC 112, first paragraph, with regard to newly added matters and enablement issues are withdrawn in response to applicant's amendment.

Drawings

6. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "light emitting diodes arranged on a two-dimensional grid pattern with one the diodes offset from a line connecting the other two remaining diodes... to emit light (must have three different beams of light) out of a plane formed by the grid" and parallel lights emitting from three light emitting diodes emitting three colors of light (must have three separated light beam) incident on the half mirror and then being incident at *respective different angle* on the reflective liquid crystal display must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. **Claims 7-11 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification fails to teach how could the three color light beams would incident onto the reflective liquid crystal display at respective different angles. The specification as shown in Figures 11

and 12, explicitly teaches that the three color lights are collimated toward the half mirror. The LEDs are arranged on a two-dimensional *plane* as required, this means the three light beams will incident on the half mirror with equal angle, (something like 45 degrees as shown in Figure 11), and this means they will incident on the reflective liquid crystal display also at equal angle, (i.e. 90 degrees as shown in Figure 11).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1, 4 and 7-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Kato et al (PN. 5,852,504) in view of the patents issued to Sekiguchi et al (PN. 5,798,864), Popovich et al (PN. 6,115,152) and Eichenlaub (PN.5,410,345).

Kato et al teaches a *holographic image display* that is comprised of a *computer* for calculating phase information from three dimensional coordinate data of *objects* (Figures 1-2) to create *computer generated hologram fringe information* wherein the phase information or computer generated holographic fringe information is provided by a *controller* (138, Figure 28) to a ***reflective*** *spatial light modulator* (130, **Figure 28**) such as a *liquid crystal display device*, (Figure 26, column 12, lines 7-10) to display the computer generated holographic *fringe* information on the ***reflective*** liquid crystal display device. Kato et al teaches that a *semiconductor laser light source* (134) is used to illuminating the reflective liquid crystal display **via** a *half mirror* (142) such that a three dimensional image of the objects, (objects used for calculating the computer generated holographic fringe information) is reconstructed from the

reflective liquid crystal display device and is *projected* by the *half mirror* to an observer, (please see Figure 28, columns 11-12). The data of the three-dimensional object used for creating the computer-generated hologram is externally obtained, (please see Figures 6-7). The controller or the computer is connected to the reflective liquid crystal display, (please see Figure 28).

This reference has met all the limitations of the claims. This reference however does not teach explicitly to use a pinhole filter and a collimator lens disposed between the light source and the half mirror, however this reference does teach that *collimated* light is used to illuminate the liquid crystal display device. **Kato** et al in a different embodiment teaches that a *pinhole filter* (for creating point light source) and a *collimator lens* (216 or 218, Figure 35) can be used to create *collimated illumination* light beam to illuminate the liquid crystal display device. **Sekiguchi** in the same field of endeavor also teaches to use *pinhole filter* and *collimator lens* (202a, Figure 9) between the laser light source and the half mirror for creating *collimated illumination light beam* for illuminating the display device, for displaying a computer generated Fraunhofer diffraction image (which can be one form of computer generated holographic image). It would then have been obvious to one skilled in the art to apply the teachings to modify the holographic image display device of Sato et al to use pinhole filter and collimator lens to *effectively* create the *collimated* illumination beams needed.

Both Kato et al and **Sekiguchi** teach a *full color display* wherein three light sources each generating one primary color of light are being used to illuminate the display, (please see Figure 36 of Kato et al and Figure 9 of Sekiguchi), which meet the feature "that the parallel light that illuminate the display is formed from three light-emitting diodes emitting three primary light at the same time and the colors of the light incident on the half mirror". The generated three color light beams will incident on the half mirror (142, Figure 28 Kato et al) in the reflective mode. These references teach to use laser light sources but do not teach *explicitly* that the light emitting diodes are used as the light sources. **Kato** et al in fact teaches that the light sources are *semiconductor laser* that emitting red, green or blue light

respectively, (please see column 11, lines 40-60), one skilled in the art would understand that a semiconductor laser **is essentially** a *light emitting diode light sources* for they all based on same semiconductor p-n junction for emitting the light. **Popovich** et al in the same field of endeavor also teaches that either laser diode (semiconductor laser) of light emitting diodes, (LEDs) may be used to illuminate a reflective holographic display to provide the reconstructed full color holographic image, (please see column 21, line 28 to column 22, line 6). It would then have been obvious to one skilled in the art to apply the teachings of **Popovich** et al to modify the display device of **Kato** et al to use high power LEDs as the light sources for producing the full color images for the benefit of using bright light sources with high output power and narrow bandwidth to improve the image quality.

Claims 1 and 7 have been amended to include the phrase that the "light emitting diode array including three light-emitting diodes arranged respectively on a two-dimensional grid pattern with one of the diodes being offset from a line connecting the other two remaining diodes ... emit light out of a plane formed by the grid pattern" or "LEDs arranged on a two-dimensional grid pattern... with one of the diodes being offset from a line connecting the other two remaining diodes". **Kato** et al teaches that the three light sources, (for generating red, blue and green light respectively), are arranged in a two-dimensional array manner, (please see Figure 36). One skilled in the art would understand in order for each of the light beam to illuminate the spatial light modulator (SLM, 200, 202, 204, Figure 36), arranged in *two dimensional manner*, the light sources have to be arranged also in two dimensional manner, (i.e. the semiconductor light sources (206, 208, 210) have to be **aligned** with the optical axes of the SLM respectively), since the collimating light beams from the three light sources will not be able to turn direction by themselves or by SLM to form the orthogonal arranged light beams as they incident on the half mirror. However this reference does not teach that the three color light sources are arranged so that lights are emitted from a plane formed by the two dimensional light sources patterns. But one skilled in the art must understand that since the three primary color lights are used to illuminate

the liquid crystal display device to produce full color display. The three color light beams have to be aligned with the arrangement of the color sub-pixels to produce the full color display. As demonstrated by Eichenlaub in a full color image display arrangement, light sources with red LED (174, Figure 13), green LED (175) and blue LED (176 and/or 177) are arranged in a *two dimensional grid pattern* with one LED (such as the blue LED) offset from the line connecting the remaining two LEDs (red and green) so that the light emitting diodes for the three primary color can be used to illuminate a pixel of the liquid crystal display to produce the full color image display. It would then have been obvious to one skilled in the art to arrange the three color light sources in a grid pattern that matches the pixels on the liquid crystal display to efficiently illuminate the display to provide full color image display.

With regard to claim 7, by using the light sources arranged in two dimensional grid pattern as taught by Eichenlaub, it would inherently require the three color light beams being projected to the half mirror (142, Figure 28 of Kato et al) at different spatial locations. However the specification fails to teach how would this requires the three color light being incident on the reflective display at different angle. This feature therefore cannot be examined since the specification teaches otherwise. **Popovich** et al teaches when the color light beams are intended to illuminate *different* section of the display surface, the incidences of the light beams are at different angle to the reflective display, (Figure 20b).

The cited Kato et al, Sekiguchi and Popovich et al reference all teach that the full color reconstructed image is formed by combining the images of the corresponding colors.

With regard to claim 4, Sekiguchi teaches that a field lens is used to project the image, (please see Figure 9).

With regard to claim 9, Eichenlaub teaches that the first LED (such as red LED 174) is disposed at X direction of the second LED (such as green LED 175) and the third LED (such as blue LED 177) is disposed at Y direction of the second LED, (please see Figure 13).

With regard to claim 11, it is implicitly true that the size of reconstruction area which is the size of illumination areas of the light sources is determined by the geometric relationship between the pinhole filter, the collimator lens, the display device and the field lens.

11. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Kato et al, Sekiguchi, Popovich et al as and Eichenlaub as applied to claim 1 above, and further in view of the patent issued to Hashimoto (PN. 5,515,183).

The holographic image display device taught by **Kato** et al in combination with the teachings of **Sekiguchi, Popovich and Eichenlaub** as described for claim 1 above have met all the limitations of the claims. Both Kato et al and Sekiguchi teaches a holographic display device for displaying *computer-generated hologram* that are calculated and created by a computer. It is implicitly true that processing system is included for distributing the holographic fringe information to the liquid crystal display device for display. **Hashimoto** in the same field of endeavor further teaches a *real time* holography system wherein *parallel processing units* are used to distribute and therefore display the holographic information on a liquid crystal display, (please see Figure 5). High speed processing is certainly needed for achieving *real time* holography display. It would then have been obvious to one skilled in the art to apply the teachings of **Hashimoto** to include a high-speed parallel processing unit for distributing and displaying the holographic information on the liquid crystal display for the benefit of achieving the accuracy and the speed needed for the holographic display.

Response to Arguments

12. Applicant's arguments with respect to claims 1, and 4-11 have been considered but are moot in view of the new ground(s) of rejection. However applicant's arguments concerning the Kato et al reference does not teach that the light sources (206, 208 and 210) would form a two dimensional grid

pattern are not correct. **Any one skilled in the art** would understand in order for the light beams generated from the light sources to reach the half mirrors and therefore eye of the observer the light sources (206, 208 and 210) have to be arranged in aligned so that the collimated light is parallel or perpendicular to the optical axes of the half mirrors. This means the tow light sources (G and B) have to be in a line and the third light source (R) is offset from the line connecting G and B. Applicant being one skilled in the art must have the basic knowledge that the light beams will not be bended by the SLMs and if the light beams follow the directions drawn in the figure, the light beams will never reach the half mirrors never reach the observer.

Contact Information

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephone B. Allen can be reached on 571-272-2434. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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